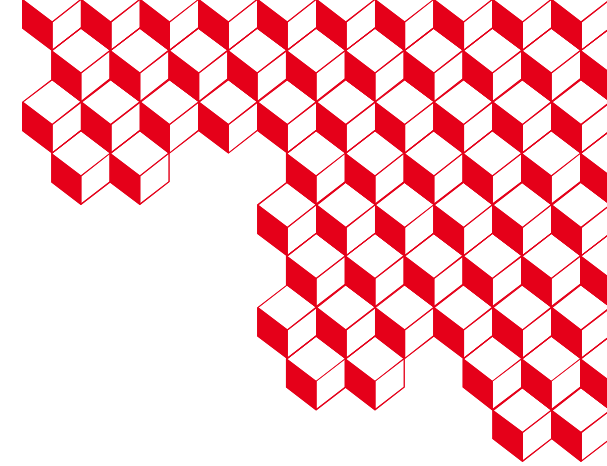




Congrès
Management
du Cycle de Vie
2025



A hybrid approach to identify social risks in upstream supply chains :

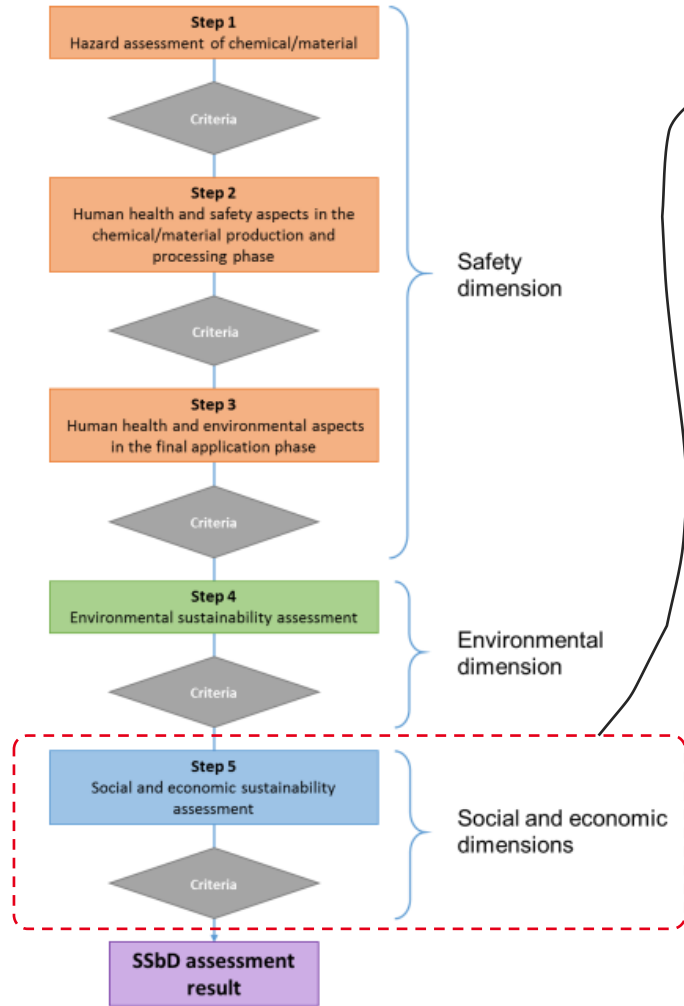
a case study on critical raw materials incorporated in solid oxide electrolysis cells

MCV 2025 - Mise en œuvre du framework SSbD (Safe and Sustainable by Design) pour les matériaux et les produits chimiques dans une perspective cycle de vie – 18.11.2025

Quentin Aubert, Cyril Laurié, CEA



Context – Social assessment and SSbD framework



Source: SSbD framework

Social dimension:

- Is rarely assessed
- Relies on recent and insufficiently proven methodologies, the most prominent one being SLCA

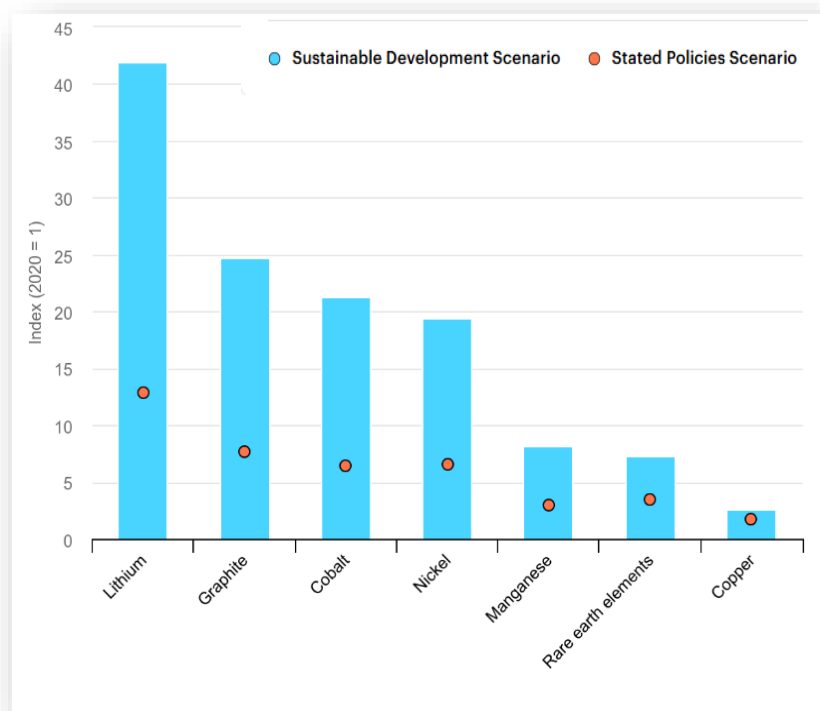
Stakeholder categories	Worker	Local community	Value chain actors (not including consumers)	Consumer	Society	Children	Stakeholders
Subcategories	1. Freedom of association and collective bargaining 2. Child labor 3. Fair salary 4. Working hours 5. Forced labor 6. Equal opportunities / discrimination 7. Health and safety 8. Social benefits / social security 9. Employment relationship 10. Sexual harassment 11. Smallholders including farmers	1. Access to material resources 2. Access to immaterial resources 3. Delocalization and migration 4. Cultural heritage 5. Safe and healthy living conditions 6. Respect of indigenous rights 7. Community engagement 8. Local employment 9. Secure living conditions	1. Fair competition 2. Promoting social responsibility 3. Supplier relationships 4. Respect of intellectual property rights 5. Wealth distribution	1. Health and safety 2. Feedback mechanism 3. Consumer privacy 4. Transparency 5. End-of-life responsibility	1. Public commitments to sustainability issues 2. Contribution to economic development 3. Prevention and mitigation of armed conflicts 4. Technology development 5. Corruption 6. Ethical treatment of animals 7. Poverty alleviation	1. Education provided in the local community 2. Health issues for children as consumers 3. Children concerns regarding marketing practices	Impact subcategories

Source: UNEP SLCA Guidelines

Context – Critical raws materials and clean energy technologies

“ The rapid deployment of clean energy technologies as part of energy transitions implies a significant increase in demand for minerals. ”

IEA, 2021



Growth in demand for selected minerals from clean energy technologies by scenario, 2040 relative to 2020.

IEA

“

The transition to a low-carbon economy presents a profound challenge: with an estimated **50% of the world's supply of critical minerals lying on or near Indigenous Peoples' lands.**



20 YEARS OF
Business & Human Rights
Resource Centre

Human rights and environmental **abuses** associated with mining operations **are rising**. Local communities, Indigenous peoples and Human Rights Defenders bear the brunt of the abuses.

Objectives of the study

Assessing the **social risks** linked to the **upstream value chain of 6 CRM** present in a SOE cell through two approaches :

- A **documentary analysis**
- A **SLCA-inspired quantitative risk analysis**

27 Co Cobalt 58.933	28 Ni Nickel 58.693	38 Sr Strontium 87.62	40 Zr Zirconium 91.224	57 La Lanthanum 138.905	39 Y Yttrium 88.906
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A focus on upstream value chain

- Where most of social impacts could occur
- Industrial mining and artisanal-scale mining are among sectors where human right abuses are the most

A focus on CRMs in a SOE cell

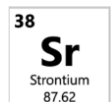
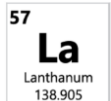
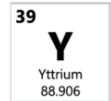
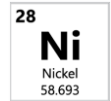
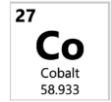
- Richer and detailed documentation
- Intrinsic social impacts linked to supply risk
- Important contribution to social issues relative to their mass percentage in final products
- Transferable to other technologies

2 approaches to social risk identification

- Confronting field investigations reports and quantitative methods
- Contributing to the improvement of social impacts assessments

Scope of the study

34 configurations are studied, each constituted by **a CRM, a life cycle stage** and **the localization** of the activities happening at said stage



	Material	Country	Step		Material	Country	Step
1	Nickel	Australia	Mining	18	Lanthanum	China	Refining
2		Indonesia		19		Malaysia	
3		New Caledonia		20		Australia	
4		Philippines		21		DRC	Mining
5		Russia		22		Russia	
6		Canada	23	China	Refining		
7		China	24	Finland			
8		Indonesia	Refining	25	Australia	Mining	
9		Japan		26	China		
10		Russia		27	Myanmar		
11	Strontium	China	Mining	28	Yttrium	China	Refining
12		Iran		29		Myanmar	
13		Spain		30		Australia	
14	Lanthanum	Australia	Mining	31	Zirconium	China	Mining
15		China		32		Madagascar	
16		Myanmar		33		Senegal	
17		USA		34		South Africa	

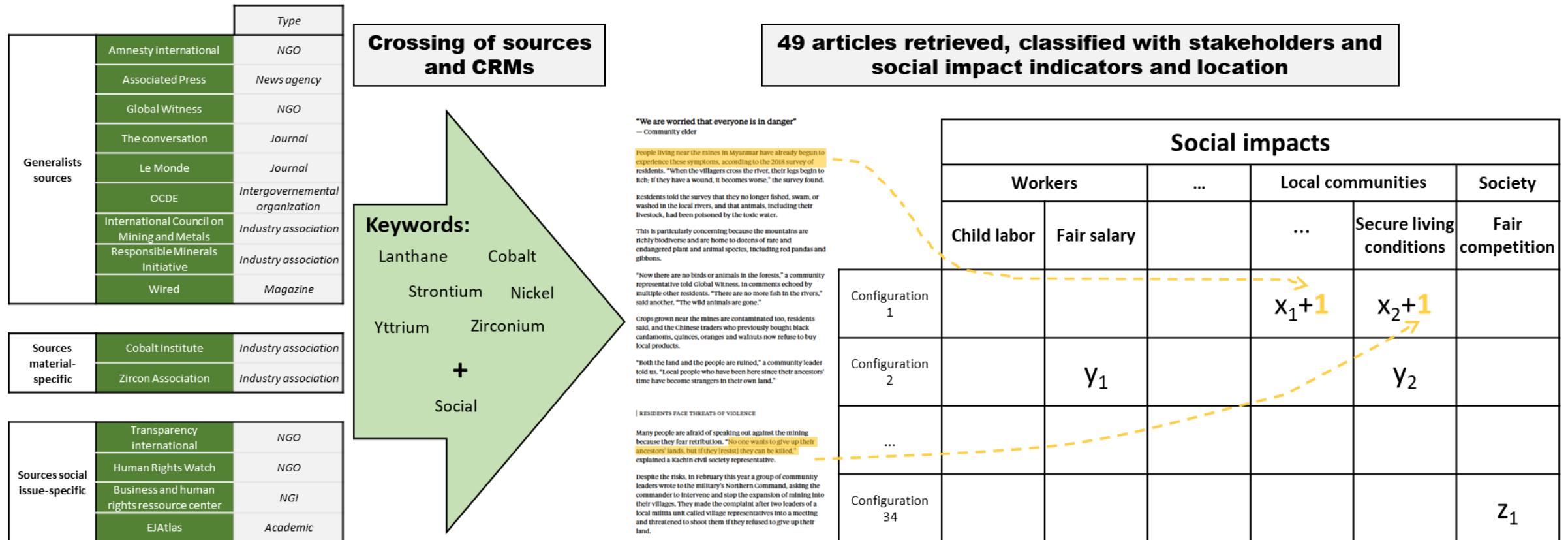
Only **countries with > 5% of worldwide activities** for the considered stage were integrated in the study

Social impacts were considered to impact one of the following 6 categories of stakeholders :

Workers, Local communities, Society, Value Chain Actors, Consumers and Children.

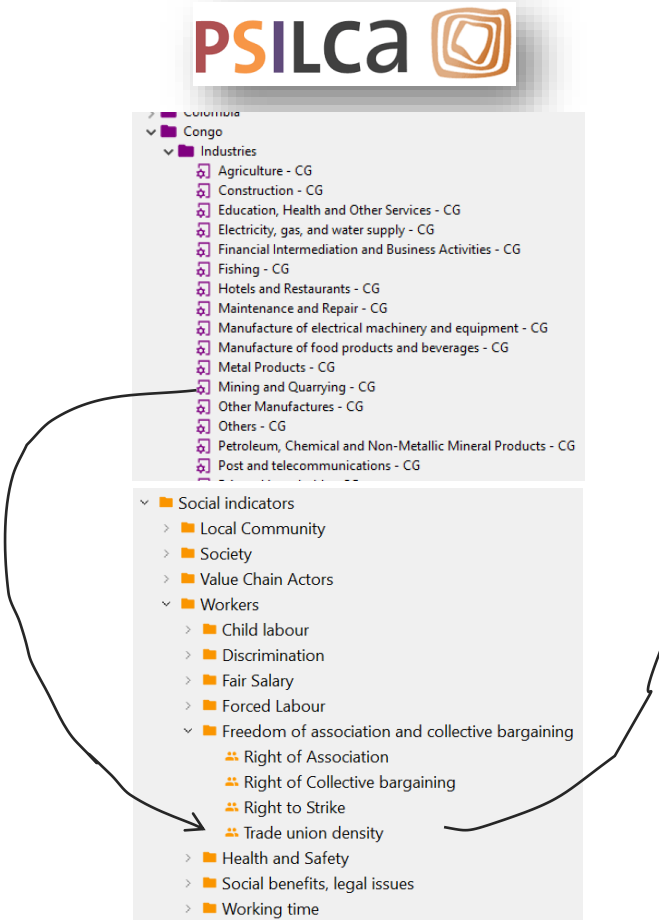
Approach 1 : Documentary analysis

Using public sources available online to conduct a semi-quantitative analysis with the help of the UNEP SLCA framework.



Approach 2 : SLCA-inspired quantitative risk analysis

Using the PSICLA database to retrieve risks level associated with the configurations defined in the scope.



1 **Donnée brute** spécifique à un processus du système de produit

Ex : **19% d'employés syndiqués** dans le secteur minier au Congo

2 **Score de risque**

Indicator value y, % of employees organised in trade unions	Risk level
$20 \geq y$	very high risk
$20 < y \leq 40$	high risk
$40 < y \leq 60$	medium risk
$60 < y \leq 80$	low risk
$80 < y$	very low risk

Spécifique à chaque indicateur

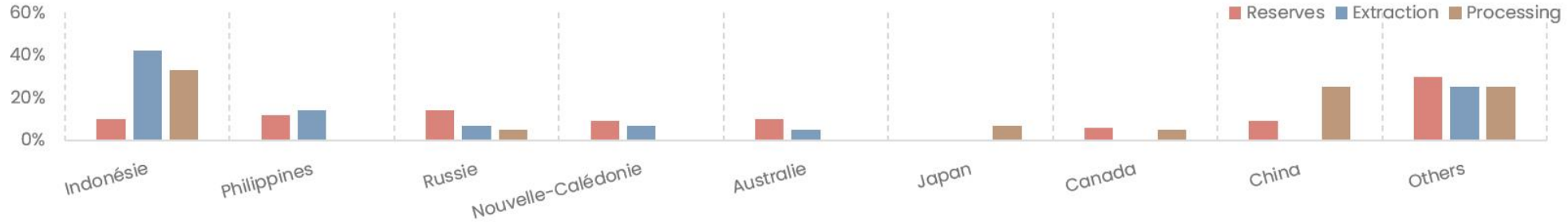
3 **Facteurs de caractérisation**

Risk/opportunity level	Factor
Very low risk	0.01
Low risk	0.1
Medium risk	1
High risk	10
Very high risk	100
No risk/ opportunity	0
Low opportunity	0.1
Medium opportunity	1
High opportunity	10
No data	0.1

Commun à tous les indicateurs

Results : Nickel case

Production data



Mining

Refining

PSILCA

	Workers	Local Community	Society	Value Chain Actors	Consumers	Children
Australia	Not included	Not included	Not included	Not included	Not included	Not included
Indonesia	Not included	Not included	Not included	Not included	Not included	Not included
New Caledonia	Not included	Not included	Not included	Not included	Not included	Not included
Philippines	Not included	Not included	Not included	Not included	Not included	Not included
Russia	Not included	Not included	Not included	Not included	Not included	Not included

	Workers	Local Community	Society	Value Chain Actors	Consumers	Children
Canada	Not included	Not included	Not included	Not included	Not included	Not included
China	Not included	Not included	Not included	Not included	Not included	Not included
Indonesia	Not included	Not included	Not included	Not included	Not included	Not included
Japan	Not included	Not included	Not included	Not included	Not included	Not included
Russia	Not included	Not included	Not included	Not included	Not included	Not included

Documentary Research

	Workers	Local Community	Society	Value Chain Actors	Consumers	Children	Number of contributions
Australia	0	0	0	0	0	0	0
Indonesia	9	9	0	0	0	0	9
New Caledonia	0	0	0	0	0	0	0
Philippines	4	4	0	0	0	0	4
Russia	1	0	0	0	0	0	1

	Workers	Local Community	Society	Value Chain Actors	Consumers	Children	Number of contributions
Canada	0	0	0	0	0	0	0
China	0	0	0	0	0	0	0
Indonesia	10	10	0	0	0	0	10
Japan	0	0	0	0	0	0	0
Russia	1	0	0	0	0	0	1

Discussion

DOCUMENTARY RESEARCH

- **Analysis :**
 - **Workers and local communities** receiving the **biggest focus**
 - Amount of **data** and **media relay** very **variable according to materials** considered
 - Enables a comprehension of impact in detail and its **potential causes**
- **Limits :**
 - Based on a **limited number of public sources**
 - **Time-intensive**
 - Risk identification but **no quantification**
 - **Few data, sometimes none**, on social issues, countries or materials
 - **Predominance of negative impacts** documentation
 - **Subjectivity** biasing the analysis

PSILCA CALCULATION

- **Analysis :**
 - **More data available** than documentary research
 - **Quantified** risk/opportunity
 - **Rapid** assessment
- **Limits :**
 - **Low geographic resolution**
 - **Less actual** than documentary research
 - **Approximations** due to sector-specific data and limited number of sectors by countries
 - **Difficult results interpretation**
 - **Predominance of negative risks** indicators



Conclusions

- **Social risks seem sensitive to location**, with some countries more prone to high risks in both approaches.
- **Most stakeholders affected differ** depending on the methodological approach
- **Children & Consumers** are rarely covered.
- None of the approach seem satisfying on its own. A **hybrid approach** could cover some of the described limitations.

Perspectives

- **Enlargement** of the documentary research **scope** :
 - **Countries with less than 5%** of worldwide activities
 - Include **more** publicly available **sources**
 - **Extend the materials considered** => towards a « social risk database » for CRMs
- **Automatize** the documentary research **coding** ? /!\ Loss of context
- **Company-based study** with primary data collection